Abstract No. dhez594

Compatibilization of immiscible Polymers Blends

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Beamline: X1A

The morphology of multi-component polymer blends is generally unstable in the melt and the different polymer components will phase separate and create large agglomeration of like-phases. Stabilization of polymer blends for improved properties usually requires the addition of another component, which is often an expensive emulsifying agent such as a block copolymer. This component will ideally localize to the polymer-polymer interface and reduce the interfacial tension, thus stabilization the morphology by reducing the driving force for phase separation. Preliminary previous results indicated that clay could be a cheap, universal compatibilizer [1]. We extended these studies to include Nanotubes and POSS (Polyhedral Oligomeric Silsesquioxanes) as additives.

We are examining the effect of these additives on binary polymer thin film blends. Films composed of 50-50 weight-% of polystyrene (PS) and poly(methyl methacrylate) (PMMA were spun cast from toluene onto Si_3N_4 membranes. Identical films were prepared both with and without additive. All films were annealed in a vacuum oven at 165˚C for 24 hours, quenched to room temperature and then transfer to EM grids for characterization with the Stony Brook Scanning Transmission X-ray Microscope (STXM) at X1A.

Figure 1 shows the Polystyrene (PS) phase (the PS appears black) for the different materials prepared. (Corresponding images that map the PMMA are not shown.) We observe generally smaller domain in these images for samples that contain clay, nanotubes or POSS. This suggests that clay, nanotubes and POSS can act as compatibilizers for polymeric systems. The mechanism of stabilization on polymer blends is present insufficiently understood and requires additional studies.

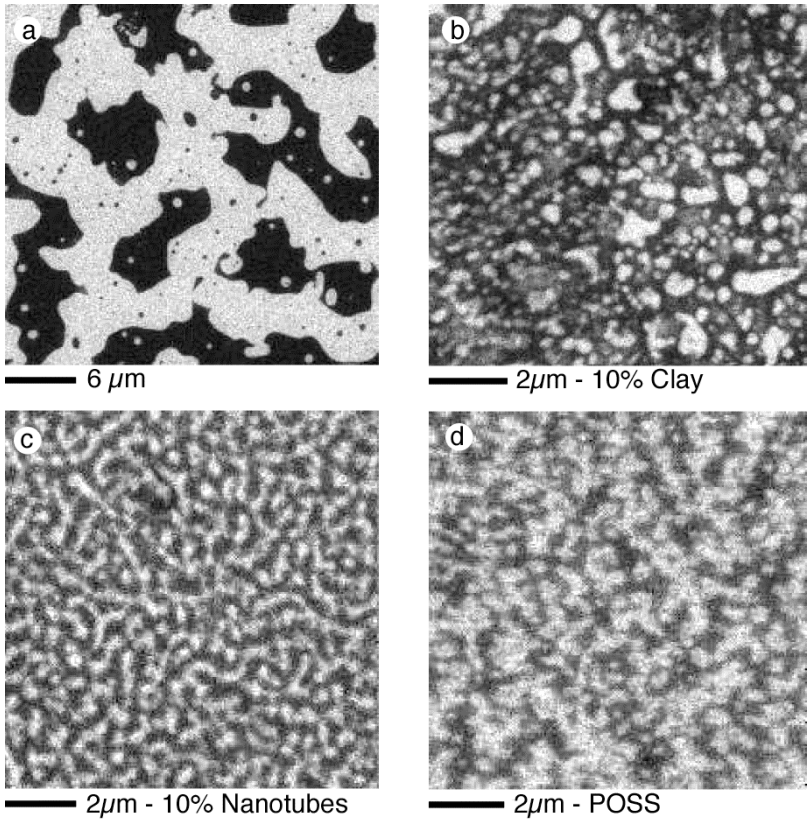

Figure1. PS map of PS-PMMA Blends annealed at 165°C for 24h. a) without additive, b) with 10% clay, c) with 10% nanotubes, d) with POSS.

References:

[1] Winesett, D.A., *et al.*, *X-Ray Microscopy of Polymer Blends Compatibilized with Clay Nanocomposites.* Microscopy and Microanalysis, 2000. **6 S-2**: p. 1120-1121.